

What is claimed is:

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1. A field effect transistor mixer comprising:

- a balun having a primary and a secondary, the primary coupled 5 to a radio frequency signal input;
- a pair of field effect transistors, each transistor having a gate, a source, a drain, and a channel between the source and the drain, wherein

- the gates of the transistors are coupled to one another and to a local oscillator input,
- one of the source and the drain of a first of the two transistors is coupled at a node to one of the source and the drain of the other of the two transistors, and the node is coupled to ground,
- the other of the source and the drain of the first of the two transistors is coupled to one side of the secondary of the balun and the other 15 of the source and the drain of the second of the two transistors is coupled to the other side of the secondary of the balun;
- and an intermediate frequency signal output coupled to a point in the circuit path between the first and second transistors.

20 2. A mixer according to claim 1, wherein, at the node, one of the source and the drain of the second of the two transistors is connected to ground, and the node is coupled to one of the source and drain of the first of the two transistors by a filter.

25 3. A mixer according to claim 2, the filter having a capacitor serving as a shunt at the frequency of the Radio frequency signal but not at the frequency of the intermediate frequency signal.

30 4. A mixer according to claim 1, wherein the local oscillator input is coupled to the gates via a capacitor so as to cause the transistors to be biased near pinch off.

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5. A mixer according to claim 1, further comprising a capacitance disposed across the balun secondary to tune the secondary.

6. A mixer according to claim 5, wherein the capacitance includes a pair 5 of capacitors connected in series, wherein the node at a connection between the capacitors is coupled to ground.

7. A mixer according to claim 1, wherein the secondary has a center tap, and the center tap is coupled to ground. 10

8. A method of mixing a periodic signal and a radio frequency signal producing an intermediate frequency signal, the method comprising: applying the radio frequency signal to a primary of a balun; applying a periodic signal simultaneously to a first and a second 15 switch, each switch coupled to the other switch and also coupled to a secondary of the balun, resulting in a frequency translation of the periodic signal and the radio frequency signal producing a mixed output; and outputting the intermediate frequency signal by filtering the mixed output between the first and second switch. 20

9. A method according to claim 8, wherein the step of outputting the intermediate signal by filtering the output between the first and second switch includes coupling one switch at a node to ground, and coupling the other switch to the node by a filter. 25

10. A method according to claim 8, wherein the step of filtering of the mixed output includes applying a capacitance that serves as a shunt at the frequency of the Radio frequency signal but not at the frequency of the intermediate signal. 30

11. A method according to claim 8, further comprising applying a capacitance across the balun primary to tune the primary.

12. A method according to claim 8, further comprising applying a capacitance across the balun secondary to tune the secondary.

13. A method according to claim 12, wherein the capacitance includes a 5 pair of capacitors in series, wherein the node at a connection between the capacitors is coupled to ground.

14. A method according to claim 8, further comprising coupling ground to the center tap of the balun secondary.

15. A field effect transistor Mixer comprising:

a. a transformer having a primary and a secondary, the primary coupled to a Radio frequency signal;

15 b. a pair of switches, comprising of a first switch and a second switch, wherein

i. the gates of the switches are coupled to one another and to a periodic signal input,

20 ii. the first switch is coupled at a node to ground, and the node is coupled to the second switch,

iii. one switch is attached to one side of the secondary of the transformer, and the other switch is attached to the other side of the secondary of the transformer; and

25 c. an intermediate frequency signal output coupled to a point in the circuit path between the first and second transistors.

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16. A mixer according to claim 15, wherein, at the node, one of the switches is connected to ground, and the node is coupled to the other switch by a filter.

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17. A mixer according to claim 16, the filter having a capacitor serving as a shunt at the frequency of the Radio frequency signal but not at the frequency of the intermediate frequency signal.

18. A mixer according to claim 15, further comprising tuning circuitry disposed across the transformer's secondary.

19. A mixer according to claim 15, wherein the secondary of the  
5 transformer has a center tap, and the center tap is coupled to ground.

20. A mixer according to claim 15, further comprising tuning circuitry disposed across the primary of the transformer.

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